

## WHAT IS CLAIMED IS:

1. A method for manufacturing a semiconductor device, said method comprising the steps of:

5       forming an insulating film on a semiconductor base material, said insulating film being predominantly composed of organic siloxane and containing an organic component which has no chemical bond to said organic siloxane; and

10       applying plasma treatment to said insulating film to remove said organic component and form a modifying layer on a surface of said insulating film.

2. The method for manufacturing a semiconductor device according to claim 1, wherein said insulating film forming step  
15 is performed by a chemical vapor deposition method.

3. The method for manufacturing a semiconductor device according to claim 1, wherein said insulating film forming step includes steps of:

20       coating said semiconductor base material with an insulating film composition containing said organic siloxane and said organic component; and

25       heat treating said insulating film composition at a temperature between 100°C and 200°C.

4. The method for manufacturing a semiconductor device according to claim 1, wherein said plasma treatment is performed using a gas containing at least one selected from the group consisting of oxygen, hydrogen and nitrogen.

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5. The method for manufacturing a semiconductor device according to claim 1, wherein molecules of said organic siloxane

contain an alkyl group or an allyl group.

6. The method for manufacturing a semiconductor device according to claim 5, wherein said organic siloxane is MSQ.

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7. The method for manufacturing a semiconductor device according to claim 1, further comprising a step of:

after said plasma treatment, heat treating said insulating film at a temperature between 250°C and 450°C.

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8. The method for manufacturing a semiconductor device according to claim 1, further comprising a step of:

after said plasma treatment, heat treating said insulating film at a temperature between 400°C and 450°C.

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9. A method for manufacturing a semiconductor device, said method comprising the steps of:

forming an insulating film on a semiconductor base material, said insulating film being composed of organic siloxane; and

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applying plasma treatment to said insulating film to remove an organic group from said organic siloxane and form a modifying layer on a surface of said insulating film.

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10. The method for manufacturing a semiconductor device according to claim 9, wherein said insulating film forming step is performed by a chemical vapor deposition method.

11. The method for manufacturing a semiconductor device according to claim 9, wherein said insulating film forming step includes steps of:

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coating said semiconductor base material with an

insulating film composition containing said organic siloxane and said organic component; and

heat treating said insulating film composition at a temperature between 100°C and 200°C.

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12. The method for manufacturing a semiconductor device according to claim 9, wherein said plasma treatment is performed using a gas containing at least one selected from the group consisting of oxygen, hydrogen and nitrogen.

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13. The method for manufacturing a semiconductor device according to claim 9, wherein molecules of said organic siloxane contain an alkyl group or an allyl group.

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14. The method for manufacturing a semiconductor device according to claim 13, wherein said organic siloxane is a phenyl methyl siloxane.

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15. The method for manufacturing a semiconductor device according to claim 9, further comprising a step of:

after said plasma treatment, heat treating said insulating film at a temperature between 250°C and 450°C.

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16. The method for manufacturing a semiconductor device according to claim 9, further comprising a step of:

after said plasma treatment, heat treating said insulating film at a temperature between 400°C and 450°C.